The changing Chinese SEA indicator guidelines

Top-down or bottom-up?

Gao, Jingjing; Christensen, Per; Kørnøv, Lone

Published in:
Environmental Impact Assessment Review

DOI (link to publication from Publisher):
10.1016/j.eiar.2013.08.003

Publication date:
2014

Document Version
Early version, also known as pre-print

Environmental Impact Assessment Review 44 (2014) 22–30

Contents lists available at ScienceDirect

Environmental Impact Assessment Review

journal homepage: www.elsevier.com/locate/eiar

The changing Chinese SEA indicator guidelines: Top-down or bottom-up?

Jingjing Gao *, Per Christensen, Lone Kørnøv

The Danish Centre for Environmental Assessment, Department of Development and Planning, Aalborg University, Skibbrogade 5, 9000 Aalborg, Denmark

ARTICLE INFO

Article history:
Received 17 May 2013
Received in revised form 11 July 2013
Accepted 15 August 2013
Available online 13 September 2013

Keywords:
Indicators
SEA
Guidelines
China
Implementation

ABSTRACT

In the last decades, China has introduced a set of indicators to guide the Strategic Environmental Assessment (SEA) practice. The most recent indicator system proposed in 2009 is based on sector-specific guidelines and it found its justification in past negative experiences with more general guidelines (from 2003), which were mostly inspired by, or copied from, international experiences. Based on interviews with practitioners, researchers and administrators, we map and analyse the change in the national guidelines. This analysis is based on a description of the indicators that makes it possible to discern different aggregation levels of indicators and then trace the changes occurring under two sets of guidelines. The analysis also reveals the reasons and rationales behind the changes found in the guidelines. This analysis is inspired by implementation theory and a description of some of the more general trends in the development of SEA and other environmental policies in a recent Chinese context. Beside a more top-down, intentional approach specifying indicators for different sectors based on Chinese experiences from the preceding years, another significant change, following the new guidelines, is a more bottom-up approach which gives more discretion to practitioners. This entails a call for practitioners to make decisions on indicators, which involves an interpretation of the ones present in sector guidance.

1. Introduction

SEA was already being discussed in China in the 1990s. Abundant practical experience in SEA has been gained in the past decades in China. The exact total number of SEA cases is not available (Wu et al., 2011), but roughly 500 cases have been conducted before 2009 (Lam et al., 2009). The Environmental Impact Assessment Law (The Standing Committee of the National People's Congress, China, 2003) was adopted in China on 1st September 2003. Since then, "Plan EIA" has been the Chinese name for SEA. The Plan EIA Regulation came into force on 1st October 2009, and Plan EIA became mandatory for many types of planning in China (The State Council of the People's Republic of China, 2009). Together with the launching of the EIA Law in 2003, a preliminary national "Technical Guidelines for Plan EIA" was issued (The State Environmental Protection Administration of China, now renamed the Ministry of Environmental Protection of China, 2003). The guideline was administered by the State Environment Protection Administration, which has later changed its name to the Ministry of Environment Protection (MEP). After years of practice, based upon the practical experiences gained since 2003, a revision of the guidelines for Plan EIA was launched by the authorities in 2009 (Ministry of Environmental Protection of China, 2009a, 2009b, 2009c, 2009d, 2009e, 2009f, 2009g). This revision resulted in a proposal for new, updated guidelines consisting of a series of sectoral guidelines for plans within different sectors rather than only a general guideline.

The new guidance drafted in 2009 is expected to be implemented as it addresses some of the problems experienced with the first version from 2003. The revision of the guidance from general to sector-specific indicators owes its existence to the fact that the general guidelines did not cover many of the more sector-specific problems and thus did not address all concerns relevant to planning and decision-making. Following the process of establishing a system of guidance and then looking into the problems it encounters during its implementation will leave us with a more precise understanding of how the Chinese authorities work with these topics and how different opinions and expectations will influence the way that the guidance for indicators are being implemented in this case.

This article addresses how the use of SEA indicators has developed in China over the last decade. The aim of the article is firstly, to describe the changing Chinese guidelines and how they have developed and secondly, to interpret the rationales behind this change, making use of recent experiences with Chinese implementation of environmental policies. This study underlines the fact that disputes on technical matters are often the companions of a dispute fuelled by political differences and conflicting interests. The development of the national guidance system is seen through the lens of implementation theory and SEA is interpreted as an implementation process. The process of changing one set of guidance for another is thus seen as part of a policy-formation process. Two implementation approaches, namely

* Corresponding author at: The Danish Centre for Environmental Assessment, Department of Development and Planning, Aalborg University, 9000 Aalborg, Denmark. Tel.: +45 99403652.
E-mail address: Jingjing@plan.aau.dk (J. Gao).

0195-9255/$ – see front matter © 2013 Elsevier Inc. All rights reserved.
http://dx.doi.org/10.1016/j.eiar.2013.08.003

top-down approach and bottom-up approach, are applied when looking into how indicator guidelines are implemented in China's SEA system.

The study is based on the two versions of the Technical Guidelines for Plan EIA in China and the indicator sets that were launched concomitantly. Using information based on a content analysis of these texts as well as an analysis of the indicators developed and proposed for the two sets of guidelines, we also conducted interviews to unveil the practical use of indicators in Chinese SEA. Interviews were also used for analysing the content and background behind the changes to the 2003 version that were included in the new version drafted in 2009. In the following section, we present the theoretical basis for the study, which includes some aspects of implementation theory covering top-down and bottom-up processes and the role of practitioners. In Section 3 we describe the methodological design of this study. The results of the analysis are presented in Section 4, which includes a description of the SEA indicator system in China and how it has recently changed. In Section 5 we will reflect on the changes made to the guidelines, inspired by the viewpoint of implementation theory. In the last section, we conclude on our analysis.

2. Implementation theory as point of departure

In this article, based on some recent comprehensive books on the policy process as well as individual works by some prominent scholars in this field of research, implementation theory is used for sketching some of the tendencies in Chinese society that are helpful when trying to understand the way in which different environmental impact policies, such as SEA, are shaped. Pressman and Wildavsky introduced implementation theory as early as 1973 in their pivotal book on implementation (Pressman and Wildavsky, 1973) . The study of implementation theory flourished in the 1980s with a lot of studies trying to understand the success or lack of success encountered by many major policies or programmes launched in that period. Since then, the mention of implementation theory has almost disappeared as an individual theory; it is now seen rather as an integrated part of the analysis of the policy process (Hill, 2009; Sabatier, 2007).

2.1. Top-down versus bottom-up approach

The debate between the top-down and bottom-up perspectives in implementation theory is heavily rooted in whether a party recognises a clear-cut distinction between the formulation of a policy and its implementation (Hill and Hupe, 2002, p. 43). For those focusing on the top-down aspects of implementation theories, a clear distinction exists between policy formation and implementation as a distinction between politics and administration. In this case, implementation is looked on as a "rational process", with a clear goal and the use of standard procedures (Hill and Hupe, 2002, p. 44; Sabatier, 1986). Pressman and Wildavsky started out as top-down oriented researchers, but later developed towards a bottom-up approach, as they emphasised how communication and interaction processes influenced implementation (Pressman and Wildavsky, 1984). Sabatier (1986) also believed in a clear distinction between policy formation and implementation, although recognising that the feedback from implementation has an impact on reformulating policy. In his earlier work together with Mazmanian, Sabatier had emphasised how a top-down approach could be instrumental in controlling the implementation process, step by step, through policy design (Sabatier and Mazmanian, 1979, 1980). An obvious argument for favouring top-down processes is that the policy makers are democratically elected. However, recent research has underlined that the increasing involvement of NGOs as well as ordinary people in the policy process gives rise to a society based more on governance and deliberative democracy at the expense of top-down government (Meadowcroft, 2007). The experiences gained from the implementation of such policies can be summarised in the following key characteristics:

- The starting point is the policy to be implemented
- The goal must be seen as prior to implementation
- Stakeholders can influence the policy process just as politics can impact the implementation process
- Means for achieving the goals are identified and used by politicians
- There are linkages between different organisations and departments on different levels
- Means and organisational control are part of the policy design
- Implementation problems can be overcome by changing policy design.

For the bottom-up approach, one of the most important conclusions is that the distinction between "policy formulation" and the "implementation" process is not watertight. Rather, it is seen as two interlinked phases of an on-going process from ideas and goals through policy formulation and the execution of the different steps in the implementation process (Hill and Hupe, 2002, p.8). There are close links between the two phases as they are iterative, so politicians intervene in administrative practices just as often as different interest groups, street-level bureaucrats and target groups voice their concerns during the policy-process (Lipsky, 1980).

2.2. SEA guidance and the implementation process

To establish a better overview of the implementation process, we have outlined a general model (Fig. 1), mainly inspired by Winter (1994). The model presents a logical structure in the policy process from legislation, through the implementation, to the outcome of the SEA. The SEA decision-making process is initiated when designated plans, policies or programmes are decided upon — in this case, the national guidance for SEA involving indicator selection and use. It is often found that the established guidelines are broad in scope and allow for a variety of interpretations. The final effect of this implementation will be reflected in the output — as SEA statements or reports. The final effect also mirrors how different aspects of the SEA process are orchestrated, leading to results that are substantive (for example, to improve environmental performance) or leading to broader learning process related (for example, to democratization) (Cashmore et al., 2010; Stoeglehner et al., 2009; Zhang et al., 2013). The implementation process often leads to results because the way in which policies and plans are formulated is stricter, and therefore misunderstandings are excluded and organisations controlled so that likewise unintended impacts on the process are avoided. These efforts are often referred to as changes in "policy design", making the influence from the legitimate decision makers so precise and detailed that influences from other stakeholders are controllable.

Within the whole of SEA implementation, the focus of this research is shown by the dotted line. This article focuses firstly on the top-down approach to SEA indicators through an analysis of national guidelines, and secondly on the bottom-up approach through including experiences and reflections by practitioners. Emphasising the bottom-up perspective will underline what is happening in the SEA practice of indicator use and it will also highlight how this practice has influenced

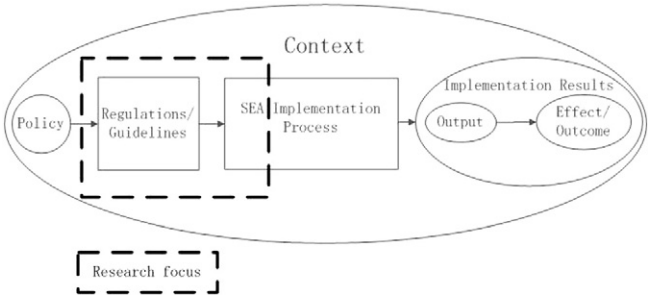

Fig. 1. SEA implementation model and the focus of the study.

the SEA and also empowered many of these groups so they had the means and understanding to continue making their voices heard.

3. Methods and data

In order to describe the changes in the Chinese SEA indicator system, we created a documentary study which included a comparison of the written guidelines from the 2003 version with the 2009 version. Furthermore, interviews were undertaken with researchers and authorities at the general level and with practitioners at the case level, to explore the drivers behind changes and the key factors which may influence the use of indicators in the future.

3.1. Documentary study

This study of the national guidelines for SEA covers both versions of the Technical Guidelines for Plan EIA, from 2003 and 2009. The study concerns different aspects of the selection and use of indictors and how they developed from the first guidance issued in 2003 to the new one drafted in 2009. We first identify the addressed themes and how they relate to the objectives of the assessment. Then the indicator sets presented in the two guidelines were analysed in order to see how they relate to the themes and objectives in the two guidelines.

3.2. Interviews

Interviews were undertaken at two levels, first at a general level with researchers and authorities and secondly at a case level with SEA practitioners. Interviews at the general level were undertaken with four interviewees in January and February 2011 in Beijing, China. The interviewees were from the national administration and from a university. Interviews at case level were with four interviewees who were involved in two SEA cases for urban master plan. Case 1 is the Strategy Environmental Assessment of Shenzhen's Master Urban Planning (2007–2020). The Shenzhen municipality is located in the very south of China with a population of around 9 million. The SEA was carried out simultaneously with the embarkation of the Master Urban Planning. As one of the pilot SEAs tested by the Ministry of Environmental Protection in China, this project was appraised by the Ministry of Environmental Protection in March, 2009. Case 2 is an SEA for the Dali Urban Development Master Plan (2008). Dali Municipality is located in southwest China, with a population of 3.29 million. In 2007, this SEA was simultaneously commissioned for the master plan revision. Additional support was provided by a provincial SIDA (Swedish International Development Cooperation Agency)-sponsored project. The interviews were undertaken in March and April 2011 in Shenzhen, Kunming and Dali, China, and in June 2012 in Denmark by phone. Except for the one interview by phone, all the others were face to face. An overview of the interview information is summarised in Table 1. Every interview is given a code: G refers to the general-level interviews and C refers to those at the case level. The interview questions were inspired by implementation theory from the perspectives of 1) analysing SEA as an implementation process, 2) understanding the top-down expectations of the revised guidelines in indicator's using and 3) exploring bottom-up interpretation of indicators' application by practitioners. The interviews were carried out based on loosely-structured open questions and conversation.

Table 2
Overview of the Technical Guidelines for Plan-EIA (2009 version).

Titles	Recommended indicator list
General principles	No
Coal industry mining area plan (published)	Yes
Urban master plan	Yes
Forestry planning	Yes
Land use plan	Yes
Onshore oil and natural gas field general exploitation and development plan	Yes

4. Changes in SEA indicator system

This study of the national Chinese guidelines for the use of indicators in SEA covers both the old and new versions of the Plan EIA Guidelines, from 2003 and 2009 respectively. The old version of guidelines from 2003 is one document which includes six sector-specific sets of recommended indicator lists as appendixes, while the new version of the guidelines from 2009 consists of six separate documents as shown in Table 2 (below).

4.1. Changing of focus

As is mentioned in the revised version of the guidance from 2009, it "*loudly emphasizes the core role of environmental objectives and the indicators in SEA as the most important basis for the whole assessment process.*" (The Technical Guidelines (revised version, 2009), p. 6). Comparison between the new and old versions of the guidelines regarding their use of indicators has been undertaken. First of all, it is immediately apparent that the involved sectors in 2003 and 2009 differ a lot. The urban plan and the land use plan are the same, while the regional plan guideline has disappeared by 2009. Further, the energy plan becomes the coal plan and the oil and gas plan while the industry and agriculture plans disappear and instead a forestry plan is introduced. What they indicate is a more focused scope of the sectoral plans.

When comparing the version from 2003 (Table 3) with the one from 2009 (Table 4), we find that there are more themes and objectives addressing more comprehensive types of plans, like urban plans and land use plans, in 2009 and urban development plans, regional plans and land use plans in the 2003 version. In the following analysis, these plans are referred to as spatial plans. Likewise, fewer themes and objectives are found dealing with resources like energy and forestry – or resource plans as we will call them in the following analysis – were present in sector-oriented plans. Generally though, it can be concluded

Table 1
Overview of interviews.

Interviewee	Title	Time	Place	Mode
G01	Professor in SEA, Beijing, China	January 2011	Beijing, China	Face to face
G02	Vice General Engineer, Ministry of Environmental Protection, China	January 2011	Beijing, China	Face to face
G03	Director, Department of Plan-EIA, Appraisal Center for Environment & Engineering, Ministry of Environmental Protection, China	February 2011	Beijing, China	Face to face
G04	Director, Department of EIA, Ministry of Environmental Protection, China	February 2011	Beijing, China	Face to face
C01	SEA project manager	March 2011	Shenzhen, China	Face to face
C02	SEA team member	April 2011	Kunming, China	Face to face
C03	SEA project manager	April 2011	Dali, China	Face to face
C04	SEA project manager	June 2012	Denmark	Phone

Table 3
Indicators listed in Guidelines 2003.

Plan's type	Guideline covering 6 sectors	Themes	Objectives	Indicators
Resource	Energy plan	5	5	19
Spatial	Regional plan	8	19	28
Spatial	Urban development plan	7	12	53
Resource	Agriculture plan	5	5	17
Spatial	Land use plan	5	8	19
Resource	Industry plan	7	7	31
Total		37 (4.5 indicators/themes)	56 (3 indicators/objectives)	167
Spatial		20 (5 indicators/themes)	39 (2.6 indicators/objectives)	100
Resource		17 (3.9 indicators/themes)	17 (3.9 indicators/objectives)	67

that the scope of the spatial plans is the same in 2009 as in 2003, but the scope of the resource plans becomes more specifically focused.

Regarding the objectives, a similar proportion is found in the two sets of guidelines (56 in 2003 and 45 in 2009). Among the spatial plans listed above, there is a clear tendency towards more objectives per plan than in the resource plans. In 2003, we find 39 objectives in the three spatial plans and only 17 in the three resource plans; in 2009 the picture is almost the same, with 26 objectives in two spatial plans and only 19 for three resource plans. Therefore, the spatial plans are, as expected, broader in perspective than the resource plans, as more objectives are formulated for them.

The distribution of indicators paints another interesting picture. In 2003 (Table 3), we find that 100 indicators describe the 39 objectives in the three spatial plans, while 67 indicators describe the 3 resource plans which only include 17 objectives. It seems quite clear that the spatial plans are broader in perspective than the resource plans as more objectives are formulated for them (more ground is covered). However, our analysis also found that for spatial plans only a few indicators are needed to describe each objective (an average of 2.6 indicators per objective) while the resource plans use more indicators to describe each objective (an average of 3.9 indicators per objective). In an overall picture, the three resource plans use much fewer indicators than the spatial plans do. With this background, it could be hypothesized that the spatial plans have more objectives as they cover a broader ground, but they then might use more aggregated data, unlike the more resource plans addressing specific types of resources which do that in more depth in the sense that more specific indicators are used to convey the more specific data which describe the relevant objectives. For 2009, the picture is that 26 objectives describe the 2 spatial plans while 19 objectives describe the 3 resource plans. Again we find that spatial plans use more objectives to describe the relevant environment (an average of 13 objectives per plan) than resource plans do (only an average of 6.3 objectives per plan). The number of indicators per objective differs very much, in a similar way to the 2003 guidance. It seems that here, again, the objectives in spatial plans are broader and might be more aggregated in nature (2.5 indicators on average per objective) while the resource plans also uses more than this (an average of 6.1 indicators per objective) to describe an objective. This hypothesis of the aggregation of indicator is further analysed in the next section.

4.2. Changing of indicator aggregation

To classify the information aggregation level of the indicators used in the Chinese SEA system, the aggregation levels of relevant indicators are studied in this article. The information aggregation level of indicators has been studied by Hammond and his colleagues, according to whom the users of the indicators should be taken into account when determining the level of aggregation that is appropriate for an indicator and the type of communication involved (Hammond et al., 1995). Braat (1991) gives a general distinction between three groups of information- and indicator-users: firstly, scientists and researchers, who require raw data that can be subjected to statistical analysis (low level of aggregation); secondly, politicians, who require data in a format that represents policy objectives, evaluation criteria and target and threshold values (moderate level of aggregation); and thirdly, the public, who require a simplified and unambiguous representation of data as a single piece of information (high level of aggregation). The relevance of this classification has also been recognised within the SEA community (Thérivel, 1996).

The different requirements of different groups of users create a challenge when designing indicators. Hammond et al. (1995) argue that the information presented to users must both be in an understandable form and convey meaningful information. The challenge is to design indicators that both reflect the goals of the policy and – in their highly aggregated form – are able to provide all the necessary technical information in a message that can be understood and accepted by politicians and the public. Donnelly et al. (2000) argue that SEA practitioners should be encouraged to develop or compose their own indicator sets that are specific to the proposed PPPs by concentrating on relevant and significant issues targeted in the scoping phase of SEA.

Several definitions and criteria are reviewed to define the aggregated indicators (also known as composite indicators). The relevant literature shows that no fundamental difference is found between 'composite' and 'aggregated' indicators, only that composite indicators are mostly used on national level (Joumard and Gudmundsson, 2010). Saisana and Tarantola (2002, p. 5) define composite indicators as "*based on sub-indicators that have no common meaningful unit of measurement and there is no obvious way of weighting these sub-indicators*".

Table 4
Indicators listed in Guidelines 2009.

Plan's type	Sectoral guideline	Themes	Objectives	Indicators
Resource	Coal plan	3	4	35
Spatial	Urban plan	15	18	38
Resource	Forestry plan	3	5	50
Spatial	Land use plan	5	8	28
Resource	Oil and gas plan	4	10	30
Total		30 (6 indicators/themes)	45 (4 indicators/objectives)	181
Spatial		20 (3.3 indicators/themes)	26 (2.5 indicators/objectives)	66
Resource		10 (11.5 indicators/themes)	19 (6.1 indicators/objectives)	115

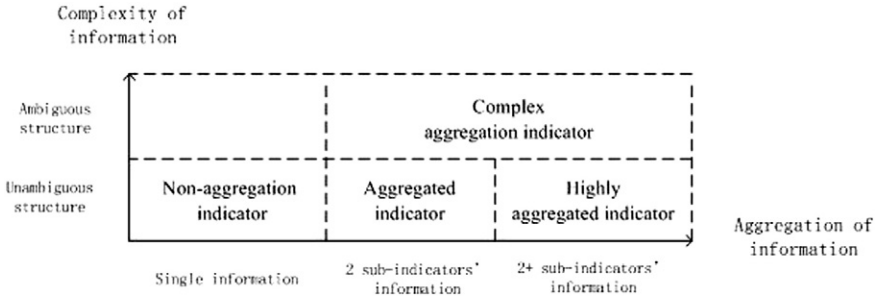

Fig. 2. Two-dimensional model developed for classifying the indicators used in SEA.

Joumard and Gudmundsson (2010, p. 283) define an aggregated indicator as "*[a]n indicator, composed of several sub-indicators not sharing a common characteristic or measurement unit*". Nardo et al. (2005, p. 8) look at composite indicators as a mathematical combination of individual indicators which represents "*multi-dimensional concepts which cannot be captured by a single indicator alone*".

When we apply these definitions to the indicators used in the Chinese SEA system, we find that it is conceptually useful to classify these indicators according to the aggregation of information, and therefore by how many types of data need to be collected in order to use an indicator. However, empirically this distinction and a quantitative approach are only possible when indicators are unambiguous and clearly express which data should be compiled. This is not always the case. Empirically, aggregated indicators can be more complex due to the ambiguous structure description. To handle this problem, the authors supplement the typical one-dimensional model of indicators, which distinguishes between levels of aggregation (and is often represented graphically as a pyramid), with a second dimension: complexity of information. Our two-dimensional model, illustrating the relationship between the complexity and aggregation of an indicator's information, is showed in Fig. 2.

The two dimensions above are used for describing the information carried by an indicator. The indicator's level of aggregation is shown horizontally in the model. For these three types of aggregations, a common factor is that the indicator produced consists of information that is combined in a straightforward way; in other words, it is unambiguous. But some of the indicators used in SEA are of a far more complicated nature. So in the above model, the complexity of the indicator is shown vertically, in which 'unambiguous structure' means that little or no room is left for interpretation as to how the indicator should be understood and what data is required. Conversely, an 'ambiguous structure' requires interpretation and elaborations in order to understand the links between one simple thing and a complex nature that is not easily translated into simple cause–effect relationships (for example, the indicator "eco-system sustainability"). This complexity dimension concerns both aggregated and highly aggregated indicators. Following the two-dimensional model, indicators can be sorted into four categories according to their aggregation level and complexity (ambiguity):

- "Non-aggregation indicator": indicators based upon single units of information (for example, X mg Pb/l, the measured concentration of Pb).
- "Aggregated indicator": indicators composed of two sub-indicators from two different sets of information that are related (for example, Y mg Pb/kg bodyweight of salmon).
- "Highly aggregated indicator": indicators with more than two sub-indicators in which different pieces of information are combined (for example, heavy metal impact on health: Z_1 mg Pb/kg bodyweight of salmon + Z_2 mg Cu/kg bodyweight of salmon + Z_3 mg Sn/kg bodyweight of salmon = total toxicity level of heavy metals in salmon).
- "Complex aggregation indicator": indicator composed of two or more sub-indicators, but with a complex, unclear, ambiguous structure (for example, sustainability of rivers).

To examine how the aggregation level of the indicators has developed from the 2003 guidelines to the 2009 version, we have analysed each indicator mentioned in the two guidelines and established an overview of how their composition changed and how that relates to the different sectors. When analysing according to the four categories defined above, it was found to be difficult, or even impossible, to distinguish between an "aggregated indicator" and a "highly aggregated indicator" in this case. Therefore all the indicators consisting of two or more than two sub-indicators with a simple, visible, unambiguous structure are sorted as "aggregated indicators" in this study. The results are shown in Figs. 3 and 4.

As can be seen from Figs. 3 and 4, there are clear indications that the indicators are shifting from relying mostly on 'non-aggregation indicators' and 'aggregated indicators' in 2003 to more 'complex aggregation indicators' in 2009. Comparing the distribution of different ways of transferring information we can identify some interesting tendencies. It is found that spatial plans have in general changed more dramatically from 2003 to 2009 than resource plans have, as substantially only very few indicators (4.5%) in this category are now based on 'non-aggregation indicators'. Another general tendency is that 'complex aggregation indicators' both for spatial and resource plans become the more dominant type of indicator. In general the total number of 'complex aggregation indicators' across both spatial and resource plans is increasing — from 28% in 2003 to 40% in 2009, while the relative amount of 'non-aggregation indicators' fell from 25% to 17% in the same period. The most spectacular progress is found in land use

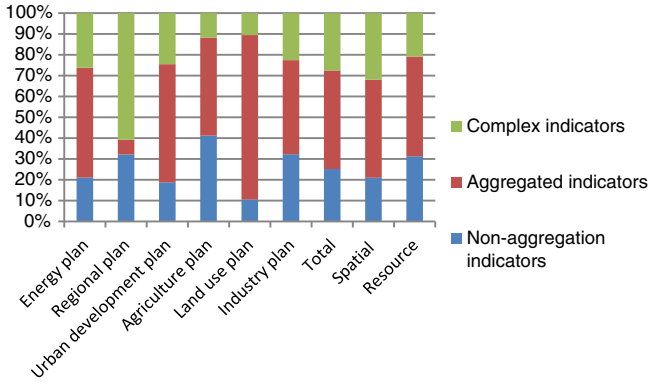

Fig. 3. Aggregation levels of indicators in the 2003 guidelines.

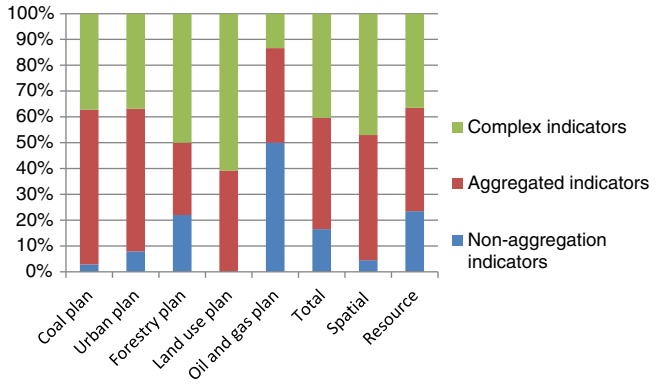

Fig. 4. Aggregation levels of indicators in the 2009 guidelines.

plans, which changed from being made up of only 11% to almost 61% 'complex aggregation indicators' in the guidelines published in 2003 and 2009 respectively. This overall developing trend also indicates that the new guidelines provide, and require, more room for interpretation in designing and using indicators in practice, as a more bottom-up approach. As analysed above, this bottom-up approach is given more emphasis in the guidelines for spatial plans than in those for resource plans, for which our argument is that, due to the nature of spatial plans, they are more likely implemented at local level, which demands more local, contextually relevant input in designing and using indicators, while resource plans could more likely be implemented at higher levels. The changes taking place between 2003 and 2009 show that the authority's understanding of indicators is changing, while the reliance on indicators had continued to increase.

5. Reflections on changes in guidelines

In this section we explore the rationales behind the changes found in the Chinese SEA indicator guidance. This exploration concerns both the contextual rationales and the more specific rationales found in official documents and expressed by practitioners and stakeholders.

5.1. SEA — Learning by doing

The first Chinese SEA experiences were not very positive (Bina, 2008). They started out by adopting a Plan-EIA which more or less resembled Project EIA (Bina, 2008), making use of the procedures and methods of project EIA at strategic level (Ahmed and Sanchez-Triana, 2008). In doing this, China was also inspired by other fields like planning. Due to the lack of its own experience, experiences from other countries were regarded as a major input for developing the Technical Guidelines (2003), which was criticised as "*more or less just a copy of the international experience*" (G01, 2011). The EIA Law launched in 2003 directly led to a need for a national technical guideline to provide practical guidance and immediate assistance to SEA practitioners. Due to the demand from the practice, the Technical Guidelines (2003) was issued without enough rational study (G02, G03, 2011). But after several years of testing, the limitations of this guideline have been recognised (G02, 2011). And the authorities underlined the guidelines' development as a learning-by-doing process (G04, 2011). So, along with the institutional development in China in the last years, as knowledge of the SEA process and its dynamics increases, and the understanding of SEA as a comprehensive tool in approaching sustainability is developing, the view that there is a need for more specific instruments grows. This is a theme often surfacing in the debate in China today, not only advocating SEA or EIA as low hanging fruits to pick but also that a genuine integration into Chinese policies demands a more specific Chinese way of doing this, i.e. reflecting the complexity of Chinese administrative and political conditions. The limitations of the Technical Guidelines (2003) are recognised over years of testing (G02, G03, 2011). China should try to do it, on its own way.

5.2. Regulative changes with strong focus on procedure

The revision of the guidelines was launched in 2009 together with a new regulation of Plan-EIA, which meant that the law and the guidelines were more in accordance with each other: "*[i]n 2009 the Plan-EIA Regulations was also launched, actually the new version of this guideline has been in accordance with the Regulations in many aspects*" (G03, 2011). The increased focus on the procedure goes hand in hand with a clearer understanding of the roles played by different parts of the process – and in the light of the theme for this article – its connection to indicators and environmental objectives. The technical guidelines draw attention to all the steps or stages to stick to: "*[a]t least 10 parts (scoping, PPPs description, environment baseline, identifying environmental objectives, impact assessment, alternatives analysis, immigration, follow-up evaluation, public participation, results) should be included in the final SEA report, in which the environmental objectives identified should describe clearly the …environmental objectives and assessment indicators…*"(The Technical Guidelines, 2009, p. 14). The guidelines can be used for different – technical and administrative – purposes. For authority, they are the standard against which SEA will be valued and reviewed. For practitioners, it is the guide for the application and practice (G01, 2011).

As in many other countries the questions of governance and decision-making are important, and, as is well known, this is one aspect of SEA which is debatable. The interviews show that this issue is also discussed in a broader scope in the Chinese context. What SEA needs to provide the decision-makers is not the exact impact, but the possibilities of different scenarios/alternatives, and using quantitative indictors (or variables) with different values, standing for different scenarios helps for this purpose (G02, 2011).

5.3. Top-down intention–bottom-up effect

The institutional structure for environmental protection is under heavy pressure from other diverging interests that also exist in Chinese society (Gu and Sheate, 2005). The dual structure consists of a vertical environmental authority competing with the horizontal structures of local governments, and the sectors with more power might even be a threat to local environmental authorities which take the implementation of EIA seriously (Gu and Sheate, 2005). Environmental authorities are thus in a weak position in the political hierarchy, having only doubtful commitment to a strict implementation of EIA (Mao and Hills, 2002). Two positions seem to be widespread among Chinese planners: firstly, the idea that guidelines should reflect the fact that sectors are different, and secondly that guidelines should in any case be strict and focused when it comes to the indicators they use. The revised version of guidelines (2009) is expected to provide a more comprehensive and broader scope in covering sectors and to give instructions based on different sectoral-level plans instead of those on a general level, and this will make the use of indicators more purpose-aimed and targeted (G01, 2011). However an expectation of the future guidelines of providing standard values for the recommended indicators in the related sectoral guidelines (G03, 2011), clearly states a more top-down intention of developing new guidelines, by requiring more specific sectoral guidelines as well as by demanding official standard values for the applied indicators to enable even more central control. There is a vast amount of different SEA and EIA to be carried out in a society with such extreme growth potentials. Due to the rapid economy growth in China, there are many different development plans. Each kind of plan, with its own characters, requires its own framework to make a SEA (G04, 2011).

Besides, the absence of specific regulations for the planning process in China is also identified as a challenge for SEA practitioners to follow a standard guide to assess the proposed plans (G03, 2011).

Besides the top-down intention, on one side, most of the interviewees agree that there should also be room for the public to be engaged in the selection of indicators. One of the expectations from an authority perspective shows that a combination of compulsory and self-chosen indicators in every single SEA identifying the key environmental objects and targets, are expected to be provided by previous experience, experts' experience and the communication with planning sectors (G04, 2011). Good examples with very effective communication and cooperation with the planning sector have been recorded. On the other hand, it is important that the analysis of SEA does not become too detailed as this might lead to a situation of 'choking in facts': *"the more detailed it is, the more useless it is as a guideline. At this stage, the most efficient method of writing guidelines is to rely on some basic principles instead of listing too much detailed information. For example, providing the environmental objects and key issues for SEA, highlighting the communicational process of SEA, and standardising the operation and application of the SEA process would be helpful"* (G04, 2011). The way forward is to keep it simple and specific according to what sector is being addressed. From the administrative perspective, two criteria were mentioned for effectively using indicators in SEA: they should be able to describe the issues and impact clearly and they should be selected and used in a rational process (G04, 2011). This was also emphasised by another interviewee: *"[g]uidelines are useful for both the SEA team and the review committee. For SEA practitioners, they show what the expected output of an SEA is. For the committee, they give a standard by which to evaluate an SEA's quality… one thing that should be highlighted is the balance of qualitative and quantitative indicators. Quantitative indictors can be effective and useful only when selected in a rational manner and at a correct aggregation level. Qualitative indictors cannot give the same level or degree of the impact. What we assess for an SEA is not only what impacts are, but also the risk of those impacts"* (G02, 2011).

6. Bottom-up: SEA practitioners' reflection

According to the implementation theory, street-level bureaucrats play an important role in defining how indicators are used in the practice. From the perspective of implementation on street-level bureaucrats, SEA practitioners' interpretations of indicators' using as a bottom-up implementation approach are analysed. In the following two sections we highlight the most common challenges, identified during our interviews, of using indicators in China's SEA system. Firstly we try to sketch how the external context interacts with the practice of the SEA practitioner and secondly we reveal what the internal factors are that influence the use of indicators in a SEA team.

6.1. External factors

The use of guidelines plays an important role in the SEA process. Due to the fact that China includes areas which differ tremendously, both in geography as well as economically, SEA guidelines cannot be used uniformly for all cases. For the practitioners, the Technical Guidelines (2003) provides one pattern for SEA in all kinds of plans at all levels in the whole of China, regardless of whether it is an energy plan or an urban master plan. Therefore the recommended indicators are at a very general scope and level and it is necessary to have guidelines for different planning sectors (C01, C02, 2011). Therefore, when the recommended indicator list is uniform, while each SEA case has to deal with different stages of development and therefore addresses different environmental problems facing different parts of Chinese society, the guidelines should be used as a principle reference and there is a need to design detailed methods and indicators for specific cases (C01, 2011). In one SEA case of urban plan (Case 1), this takes place in a totally urbanised region with specific environmental issues to be addressed. Furthermore the development goal in this region differs from that in the rest of China, so the SEA team developed their own unique indicators by considering the current situation and forecasting potential new problems. In the other case (Case 2), the guidelines were used to provide some basic principles which were supplemented with the context of the specific case (C02, 2011). The practitioners (C02, C03 2011) described how to decide and develop the indicator "Tourists Staying Duration". A professional tourism research team was invited to join in the discussion, and after a tourism economy analysis was made it was decided to take tourism as the key assessment object and "Tourists Staying Duration" as a key indicator.

SEA practitioner C01 (2011) points out that whether an indicator works or not depends on whether it has been taken into account in the assessed PPPs. On one hand, the indicators used in SEA should be related to those issues the plan faces; on the other hand, the plan's future goals and management requirements should also be taken into account in the SEA. Case 1 shows that, since SEA is still at quite an early stage in China, cooperation between SEA teams and planning teams has been a challenge for implementing SEA. Actually, environmental considerations have already been taken into account by the planning sector. SEA, on the other hand, SEA team prefers to look at these environmental issues from its own angle. An example is in Case 1, where SEA set some constraining requirements for the plan, which for the planning team is of course rather negative and critical. However, after several rounds of consultative meetings, the planning sector found that the SEA requirements were actually an indirect promotion of the plan before it needed to be approved (C01, 2011). In Case 2, interaction with decision-making process has been taken into account as the SEA practitioners used the indicator in their communication with decision makers.

6.2. Internal factors

Relative good flexibility has been found in using indicators in both cases. Two factors that influence the use of indicators among practitioners have been pointed out by the practitioners in Case 1. One is capacity building — SEA practitioners' understanding of SEA and personal experience with SEA. The other is knowledge and information about the study area. The former factor relates to the methodology used to choose and use indicators, like an innovative understanding of why and how an indicator works; the latter concerns the correct identification of the contextual background of a plan. An example of this is that good indicators should also take into account upper level (provincial and national) requirements besides the local/municipal ones.

Personal experience in influencing the use of indicators was mentioned as a factor in Case 2. The previous experience of the SEA team leader in working as a vice mayor helps him to be familiar with what decision making requires. Besides, his working experience in an EIA review authority also provides him with the capacity to understand the importance of communicating with stakeholders like local authorities and enterprises. Also, in Case 2, the open atmosphere working mode was highlighted as playing an important role in deciding upon the core assessed objects and indicators. Case 2 managed to deal with the challenge of organising such a large team, which even included international experts.

7. Conclusion

Developing and applying SEA indicators are a complex task and many countries refrain from doing it as they prefer to discuss the progress of environmental factors based on more or less direct information on individual substances. The use of indicators has been investigated in the case of China, where SEA since its introduction has clung to the idea that indicators are necessary for conveying a more complete picture of the context to increase the effectiveness of SEA. Indicators

can be very different as it is also underlined that they should, on the one hand, mirror differences in local environmental conditions but, on the other, also make it possible to make comparisons between different regions. It is therefore necessary to have some guidelines that can set the framework for how indicators should be used. Although the revised guidelines from 2009 are not decided yet, they have attracted much discussion since they were under hearing, which deserves deeper scientific analysis before formal decision-making. Whether these guidelines will be changed and when they will be implemented is uncertain albeit, this research provides a scientific lens of implementation, which potentially can feed into this ongoing policy process.

Comparing the two versions of China's SEA guidelines clearly demonstrates that a lot of changes took place between 2003 and 2009. First of all there is a change in the approach to address problems. The sectors have become more specifically aimed at a narrower group of industries. Moving in the direction of a more narrow definition of branches of these industries and a broader use of more aggregated information by indicators, the result could be a more streamlined indicator set. Firstly, as the scope of the spatial plans is roughly the same in 2003 and 2009, for the resource plans the scope gets narrower. Secondly, there is a clear tendency towards having more objectives per plan in the spatial plans than in the resource plans. As expected, spatial plans are broader in their perspectives than the resource plans since more objectives are formulated for those. Thirdly, the indicators in spatial plans are broader and more aggregated or complex in nature, while the resource plans still use more indicators to describe an objective. Lastly, the used indicators are more aggregated or complex in the spatial plans than in the resource plans, which also indicates that more specific indicators describe the more narrow objectives in the resource plans.

Inspired by implementation theory, the rationales behind the changing indicator system and practitioners' reflections are explored. From a top-down perspective, contextual and specific rationales are found in documents and expressed by authorities. This shows that SEA in China is still undergoing a learning process, as is the use of indicators. Regulative changes are another driver for the revision of SEA practices. On the one hand, strong attention paid to predefined procedures also reflects an appreciation of top-down guidance. Developing from one general guideline covering all the sectors into a series of guidelines consisting of a general guideline plus five sector-specific guidelines also strengthens a top-down appreciation. An even narrower sectoral scope in terms of indicator recommendation further emphasises this intention. On the other hand, a developing trend towards a higher level of aggregation with high complexity due to ambiguity calls for a more bottom-up approach in practice. The complexity gives and requires more room for interpretation and flexibility in designing and using indicators with different stakeholders in different ways. This mixture of top-down intention with a bottom-up effect is definitely an interesting finding in this research. From the bottom-up perspective, practitioners reflect on their experiences. Firstly, guidelines play an important role in influencing the indicators' using in Chinese SEA practice. Secondly, cooperation with stakeholders and interaction and communication with decision makers are identified as the factors influencing indicators' effectiveness in SEA. Internally, capacity building, knowledge and information about the study area, personal experience and the open-minded working mode are found to be the main factors influencing flexibility in using indicators.

Overall, it is demonstrated here that guidelines are one of the core instruments for defining indicators and their use both in the whole SEA system as well as in the single SEA case. On one side, a more sectoral-oriented guidance suggests a top-down approach intention to apply indicators in SEA in China by providing guidelines for more focused branches of industry; on the other side, a more aggregated and complex indicators system paves the way for a bottom-up interpretation for using indicators, which also indirectly sheds light on including more public involvement in the decision making.

References

Ahmed K, Sanchez-Triana E. SEA and policy formulation. In: Ahmed K, Sanchez-Triana E, editors. Strategic environmental assessment for policies: an instrument for good governance. Washington DC: The World Bank; 2008. p. 1–9.

Bina O. Context and systems: thinking more broadly about effectiveness in strategic environmental assessment in China. Environ Manage 2008;42(4):717–33.

Braat L. The predictive meaning of sustainability indicators. In: Kuik O, Verbruggen H, editors. In search of indicators of sustainable development. Dordrecht: Kluwer Academic Publisher; 1991. p. 59–60.

Cashmore M, Richardson T, Hilding-Rydevik T, Emmelin L. Evaluating the effectiveness of impact assessment instruments: theorising the nature and implications of their political constitution. Environ Impact Assess Rev 2010;30(6):371–9.

Donnelly A, Jones M, O'Mahony T, Byrne G. Decision support framework for establishing objectives, targets and indicators for use in SEA. Impact Assess Proj Apprais 2000;24(2):151–7.

Gu L, Sheate W. Institutional challenges for EIA implementation in China: a case study of development versus environmental protection. Environ Manage 2005;36(1):125–42.

Hammond A, Adriaanse A, Rodenburg E, Bryant D, Woodward R. Environmental indicators: a systematic approach to measuring and reporting on environmental policy performance in the context of sustainable development. Washington DC: World Resource Institute; 1995.

Hill M. The public policy process. 5th ed. Harlow: Pearson Longman; 2009.

Hill M, Hupe P. Implementing public policy. London: Sage Publications; 2002.

Joumard R, Gudmundsson H. Indicators of environmental sustainability in transport, an interdisciplinary approach to methods. Bron Cedex, France: Les collections de l'INRETS; 2010.

Lam K, Chen YD, Wu J. Strategic environmental assessment in china: opportunities, issues and challenges. J Environ Assess Policy Manage 2009;11(4):369–85.

Lipsky M. Street-level bureaucracy: dilemmas of the individual in public services. New York: Russell Sage Foundation; 1980.

Meadowcroft J. Who is in charge here? Governance for sustainable development in a complex world. J Environ Assess Policy Manage 2007;9(3–4):299–314.

Ministry of Environmental Protection of China. Technical guidelines for plan environmental impact assessment — coal industry mining area plan; 2009a.

Ministry of Environmental Protection of China. Technical guidelines for plan environmental impact assessment — forestry planning (draft); 2009b.

Ministry of Environmental Protection of China. Technical guidelines for plan environmental impact assessment — general principles (draft); 2009c.

Ministry of Environmental Protection of China. Technical guidelines for plan environmental impact assessment — land use plan (draft); 2009d.

Ministry of Environmental Protection of China. Technical guidelines for plan environmental impact assessment — onshore oil and natural gas field general exploitation and development plan (draft); 2009e.

Ministry of Environmental Protection of China. Technical guidelines for plan environmental impact assessment — urban master plan (draft); 2009f.

Ministry of Environmental Protection of China. The explanation for technical guidelines for plan environmental impact assessment — general principles (draft); 2009g.

Nardo M, Saisana M, Saltelli A, Tarantola S, Hoffman A, Giovannini E. Handbook on constructing composite indicators: methodology and users guide. OECD-JRC joint publication. OECD statistics working paper STD/DOC(2005)3; 2005. [T00188147].

Pressman JL, Wildavsky AB. Implementation: how great expectations in Washington are dashed in Oakland: or, why it's amazing that federal programs work at all. This being a saga of the Economic Development Administration as told by two sympathetic observers who seek to build morals on a foundation of ruined hopes. London: University of California Press; 1973.

Pressman JL, Wildavsky AB. Implementation: how great expectations in Washington are dashed in Oakland: Or, why it's amazing that federal programs work at all, this being a saga of the Economic Development Administration as told by two sympathetic observers who seek to build morals on a foundation of ruined hopes. 3rd ed. London: University of California Press; 1984.

Sabatier PA, Mazmanian D. The conditions of effective implementation: a guide to accomplishing policy objectives. Policy Anal 1979;5(4):481–504.

Sabatier PA. Top-down and bottom-up approaches to implementation research: a critical analysis and suggested synthesis. J Public Policy 1986;6(1):21–48.

Sabatier PA, Mazmanian D. The implementation of public policy: a framework of analysis. Policy Stud J 1980;8(4):538–60.

Sabatier PA. Theories of the policy process. Boulder: Westview Press; 2007.

Saisana M, Tarantola S. State-of-the-art report on current methodologies and practices for composite indicator development. Ispra, Italy: JRC-IPSC (Joint Research Centre, Institute for the Protection and Security of the Citizen); 2002.

Stoeglehner G, Brown AL, Kørnøv LB. SEA and planning: 'ownership' of strategic environmental assessment by the planners is the key to its effectiveness. Impact Assess Proj Apprais 2009;27(2):111–20.

The Standing Committee of the National People's Congress, China. The Environmental Impact Assessment Law; 2003.

The State Council of the People's Republic of China. The Chinese plan environmental impact assessment regulations; 2009.

The State Environmental Protection Administration of China (now renamed the Ministry of Environmental Protection of China) Technical guidelines for plan environmental impact assessment (on trial); 2003.

Thérivel R. The practice of strategic environmental assessment. London: Earthscan; 1996.

Mao W, Hills P. Impacts of the economic–political reform on environmental impact assessment implementation in China. Impact Assess Proj Apprais 2002;20(2):101–11.

Winter S. Street-level bureaucrats and the implementation of political reforms: welfare, employment, and environmental policies in Denmark. Aarhus: Aarhus University; 1994.
Wu J, Chang I, Bina O, Lam K, Xu H. Strategic environmental assessment implementation in China — five-year review and prospects. Environ Impact Assess Rev 2011;31(1):77–84.
Zhang J, Christensen P, Kørnøv L. Review of critical factors for SEA implementation. Environ Impact Assess Rev 2013;38(January):88–98.

Jingjing Gao is a PhD researcher at the Department of Development and Planning, and The Danish Centre for Environmental Assessment at Aalborg University. Her research focuses on indicators' application in Strategic Environmental Assessment, based on Chinese and European experience.

Per Christensen is a Professor (PhD) at the Department of Development and Planning, and The Danish Centre for Environmental Assessment at Aalborg University. His main interests are environmental planning with a special focus on agriculture, groundwater protection and biodiversity, and environmental management in industry.

Lone Kørnøv is a Professor (PhD) at the Department of Development and Planning, and The Danish Centre for Environmental Assessment at Aalborg University. Her fields of interest are: SEA, planning, decision-making and governance, public participation and climate change.